

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4097 (1967): Gravel for Use as Pack in Tubewells [MED
21: Mechanical Engineering]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

IS : 4097 - 1967
(Reaffirmed 2008)

Indian Standard
SPECIFICATION FOR
GRAVEL FOR USE AS PACK IN
TUBEWELLS

Seventh Reprint MAY 2001
(Incorporating Amendment No. 1)

UDC 628.16.067.12:628.112.2

© *Copyright 1977*

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR GRAVEL FOR USE AS PACK IN TUBEWELLS

Pumps Sectional Committee, EDC 35

<i>Members</i>	<i>Representing</i>
SHRI NANU B. AMIN	Jyoti Ltd, Baroda
SHRI P. L. JAIN (<i>Alternate</i>)	
SHRI K. ASOKAN	Engineering Association of India, Calcutta
SHRI A. C. GUPTA (<i>Alternate</i>)	
SHRI BALWANT SINGH	Water Supply & Sewage Disposal Undertaking, Municipal Corporation of Delhi
SHRI M. M. PATEL (<i>Alternate</i>)	
SHRI J. R. BAMMI	Johnston Pumps India Ltd, Calcutta 1
SHRI K. ASOKAN (<i>Alternate</i>)	
SHRI K. BARATAN	Neyveli Lignite Corporation Ltd, South Arcot Distt (Madras)
LT-COL BHAGAT SINGH	Ministry of Transport & Aviation
CHIEF ELECTRICAL ENGINEER	Northern Railway, Ministry of Railways
SENIOR ELECTRICAL ENGI- NEER (M) (<i>Alternate</i>)	
GENERAL SUPERINTENDENT	Public Works Workshops & Stores, Government of Madras
SHRI JAGAN MOHAN	Central Equipment and Stores Procurement Or- ganization, Government of Uttar Pradesh
SHRI M. A. JALIHAI	Kirloskar Brothers Ltd, Kirloskarvadi
SHRI S. G. PATHAK (<i>Alternate</i>)	
SHRI R. N. KADABA	Directorate of Industries, Government of Maha- rashtra
SHRI S. Y. TIPNIS (<i>Alternate</i>)	
LT-COL P. N. KAPOOR	Ministry of Defence (R&D)
MAJ B. N. SURI (<i>Alternate</i>)	
SHRI R. MUKHERJEE	Indian Pump Manufacturers Association, Calcutta
SHRI M. P. GUPTA (<i>Alternate</i>)	
PROF N. S. GOVINDA RAO	Indian Institute of Science, Bangalore
SHRI K. SEETHARAMIAH (<i>Alternate</i>)	
SHRI P. S. RAO	Directorate General of Technical Development (Ministry of Industrial Development & Company Affairs)

(Continued on page 2)

IS : 4097 - 1967

(Continued from page 1)

Members

REPRESENTATIVE

SHRI C. M. SHAH

SHRI M. M. SHARMA

SHRI S. N. VOHRA

SHRI R. M. TADKOD (*Alternate*)

SHRI M. V. PATANKAR,
Director (Mech Engg)

Representing

Ministry of Food & Agriculture

Tata Chemicals Ltd, Mithapur

Central Board of Irrigation and Power, New Delhi

Directorate General of Supplies and Disposals
(Inspection Wing) (Ministry of Works, Housing & Supply)

Director General, ISI (*Ex-officio Member*)

Secretary

SHRI S. CHANDRASEKHARAN
Deputy Director (Mech Engg), ISI

Panel for Tubewell Material, EDC 35 : 4/P-1

Convener

SHRI R. BARATAN

Neyveli Lignite Corporation Ltd, South Arcot
Distt (Madras)

Members

SHRI P. N. GUPTA

SHRI R. A. KOTHARI

SHRI T. N. MEHTA

SHRI D. P. PANDEY

DR K. V. RAGHAVA RAO (*Alternate*)

SHRI SARABJIT PRAKASH

Irrigation Research Institute, Roorkee

Jyoti Ltd, Baroda

Bird & Co (Pvt) Limited, Calcutta

Exploratory Tubewells Organization, New Delhi

The Reliable Water Supply Service of India Ltd,
Lucknow

Indian Standard

SPECIFICATION FOR GRAVEL FOR USE AS PACK IN TUBEWELLS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 May 1967, after the draft finalized by the Pumps Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Filtration and percolation of water in tubewells is achieved by various means, such as strainers, slotted pipes, gravel pack, etc. This standard has been prepared with a view to laying down the requirements for gravel pack for use in tubewells for water supply.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the requirements for gravel for use as pack material in tubewells for water supply.

2. PHYSICAL CHARACTERISTICS

2.1 The gravel selected for packing tubewells shall consist of hard quartz (about 96 percent SiO_2) or other suitable material, with an average specific gravity of not less than 2.5. Not more than 10 percent by weight of the material shall have a specific gravity of less than 2.25. The gravel shall contain not more than two percent by weight of thin flat or elongated pieces. In the case of such pieces, the larger dimensions shall not be more than 3 times the smallest dimensions. The quartz shall be of sub-rounded to rounded grains with minimum angular features.

*Rules for rounding off numerical values (*revised*).

IS : 4097 - 1967

2.2 The gravel for use as pack shall be free from impurities, such as shale, mica, felspar, clay, sand, dirt, loam, haematite and organic materials.

3. POROSITY

3.1 The porosity of the gravel when laid as a pack shall not be less than 25 percent.

4. GRAVEL SIZES

4.1 The gravel conforming to this standard shall be of the following grades:

<i>Sl No.</i>	<i>Grade</i>	<i>Pack</i>	<i>Particle Size Range mm</i>	<i>IS Sieves (see IS:460-1962*) mm</i>
1	A	Fine gravel	Over 2.0 to 3.35	2.0, 3.35
2	B	Fine gravel	Over 3.35 to 4.75	3.35, 4.75
3	C	Medium gravel	Over 4.75 to 6.3	4.75, 6.3
4	D	Medium gravel	Over 6.3 to 8.0	6.3, 8.0
5	E	Coarse gravel	Over 8.0 to 12.5	8.0, 12.5

For determination of the particle size the corresponding sieves, selected from IS: 460-1962*, shall be used.

4.2 Particle Size Distribution — The particle size distribution of gravel shall be determined by screening through standard sieves in accordance with IS:460-1962*. The percentage distribution of the sizes shall be determined from a graph in which the percentage of material passing through each sieve is plotted against the standard aperture of that sieve. Any size, say D_{20} , will thus indicate that the cumulative weight of all the grains smaller than this size is 20 percent of the total weight of the test sample.

The uniformity coefficient of the gravel, that is, the ratio of its D_{20} to D_{10} sizes shall not exceed 2. A material with uniformity coefficient less than 2 shall be classified as uniform and if greater than 2 it shall be taken as non-uniform.

The limiting sizes given in **4.1** are the minima and maxima, and the stacks containing smaller or bigger sizes as shown by sieve analysis shall be rejected.

5. HARDNESS

5.1 The gravel shall have a hardness of not less than 5 in Moh's scale.

6. PACK AQUIFER RATIO

6.1 The pack aquifer ratio (P/A ratio) is defined as the ratio of 50 percent size (D_{50}) of the gravel pack to the 50 percent size of the aquifer. The size of gravel when used as pack in tubewells shall be

*Specification for test sieves (*revised*).

decided in accordance with the size of the aquifer material proposed to be tapped. The gravel size shall be limited as below:

- a) Uniform aquifer with uniform gravel pack.

Pack aquifer ratio — 9 to 12.5

- b) Non-uniform aquifer with uniform gravel pack.

Pack aquifer ratio — 11 to 15.5

The thickness of gravel pack shall be limited to 13 to 18 cm.

However, artificial gravel pack may not be necessary if the effective size (D_{10}) of the aquifer is greater than 0.3 mm and its uniformity coefficient is greater than 5.

7. SAMPLING

7.1 The method of drawing, reducing and packing the samples as given in clauses 5, 6 and 7 respectively of IS : 1811-1961* shall be followed. Each sample shall be not less than ten litres.

7.1.1 The gross sample selected from each sub-lot shall be individually tested for physical characteristics, porosity, particle size distribution and hardness.

7.2 Criteria for Conformity — The consignment is declared in conformity to the requirements of this standard if the following conditions as applicable are satisfied:

- a) In case the maximum limit for a requirement is specified, the value of the expression $\bar{X} + 0.5 R$ is less than or equal to the value specified.
- b) In case the minimum limit for a requirement is specified the value of expression $\bar{X} - 0.5 R$ is greater than or is equal to the value specified.

NOTE 1 — The average \bar{X} is the sum of the test results divided by the number of tests.

NOTE 2 — The range R is the difference between the maximum and minimum of the test results.

8. PACKING

8.1 The gravel shall be supplied in quantities to be mutually agreed to between the supplier and the purchaser.

*Methods of sampling foundry sands.

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 323 0131, 323 3375, 323 9402

Fax: 91 113234062, 91 11 3239399, 91 11 3239382

Telegrams: Manaksanstha
(Common to all Offices)

Central Laboratory:

Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010

Telephone

8-77 0032

Regional Offices:

Central: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 323 76 17

*Eastern: 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 60 38 43

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 235 23 15

†Western : Manakalaya, E9, Behind Marol Telephone Exchange, Andheri (East),
MUMBAI 400093 832 92 95

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001 550 13 48

‡Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road,
BANGALORE 560058 639 49 55

Gangotri Complex, 5th Floor, Bhadbhada Road, T.T. Nagar, BHOPAL 462003 55 40 21

Plot No. 62-63, Unit VI, Ganga Nagar, BHUBANESHWAR 751001 40 36 27

Kalaikathir Buildings, 670 Avinashi Road, COIMBATORE 641037 21 01 41

Plot No. 43, Sector 16 A, Mathura Road, FARIDABAD 121001 8-28 88 01

Savitri Complex, 116 G.T. Road, GHAZIABAD 201001 8-71 19 96

53/5 Ward No. 29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003 54 11 37

5-8-56C, L.N. Gupta Marg, Nampally Station Road, HYDERABAD 500001 20 10 83

E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001 37 29 25

117/418 B, Sarvodaya Nagar, KANPUR 208005 21 68 76

Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road,
LUCKNOW 226001 23 89 23

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010 52 51 71

Patliputra Industrial Estate, PATNA 800013 26 23 05

Institution of Engineers (India) Building 1332 Shivaji Nagar, PUNE 411005 32 36 35

T.C. No 14/1421, University P.O. Palayam, THIRUVANANTHAPURAM 695034 6 21 17

*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street,
CALCUTTA 700072 27 10 85

†Sales Office at Novelty Chambers, Grant Road, MUMBAI 400007 309 65 28

‡Sales Offices at 'F' Block, Unity Building Narashimaraja Square,
BANGALORE 500002 222 39 71